

## Emissions Data

House #1					House #2					House #3				
Azimuth	Freq MHz	Peak dBuV/m	QP dBuV/m	AVG dBuV/m	Azimuth	Freq MHz	Peak dBuV/m	QP dBuV/m	AVG dBuV/m	Azimuth	Freq MHz	Peak dBuV/m	QP dBuV/m	AVG dBuV/m
1					1					1				
1	4.5	46.1	37.0	26.0	1	5.0	48.1	42.6	27.1	1	5.0	49.1	42.3	27.3
2	9.0	44.1	37.7	24.9	2	8.8	52.6	45.0	26.4	2	9.2	52.0	46.6	27.9
3	11.7	50.0	41.3	34.3	3	12.3	51.4	44.4	26.4	3	11.5	58.0	48.3	26.8
4	12.3	48.8	41.3	25.3	4	14.2	49.2	43.8	21.8	4	12.0	50.3	46.0	26.8
5	15.5	33.4	27.7	24.2	5	15.0	49.3	41.5	26.0	5	13.2	44.8	37.0	23.8
6	17.2	47.0	42.5	20.9	6	17.0	45.1	40.8	20.8	6	14.5	40.3	33.2	20.1
2					2					2				
1	4.5	47.3	37.9	26.1	1	8.8	51.3	44.2	26.2	1	5.0	51.9	46.3	28.2
2	8.8	44.8	37.5	24.8	2	8.9	49.9	44.8	26.1	2	11.1	50.3	43.0	25.6
3	12.3	50.2	42.9	25.7	3	12.8	46.5	39.3	22.3	3	12.2	48.4	38.8	27.6
4	15.9	40.1	36.2	19.0	4	14.1	50.1	43.8	21.4	4	15.0	50.3	41.0	23.9
5					5	14.7	48.1	40.0	20.0	5	17.0	48.4	44.1	22.2
6														
3					3					3				
1	4.5	48.8	44.6	27.4	1	4.5	44.6	40.4	26.8	1	5.0	51.5	44.9	28.0
2	8.5	44.4	38.4	25.2	2	9.0	47.5	41.6	33.7	2	11.3	51.2	44.2	25.8
3	11.3	46.3	38.5	24.9	3	12.1	42.6	36.5	25.1	3	14.0	43.9	36.7	20.1
4	13.0	41.1	33.1	19.2	4	14.1	48.8	42.6	21.3	4	15.0	49.6	42.0	21.6
5	15.8	43.8	38.7	19.8						5	17.0	47.2	41.7	21.0
6	17.0	47.9	40.6	20.1										
4					4					4				
1	4.5	47.3	43.2	27.2	1	20.2	40.0	32.6	17.9	1	5.0	52.5	45.2	27.3
2	9.2	50.4	40.4	24.2	2	15.1	40.4	34.1	22.5	2	9.9	43.9	38.0	24.5
3	12.3	45.9	38.6	25.9	3	11.3	51.4	46.0	26.9	3	11.0	49.0	41.3	26.7
4	13.2	39.2	31.2	18.8	4	4.2	45.7	40.6	26.5	4	13.2	45.1	37.4	19.9
5										5	14.9	46.6	41.4	20.9
6														
5					5					5				
1	17.0	47.9	41.2	20.7	1	4.1	50.5	46.1	28.2	1	5.0	52.3	45.8	28.1
2	16.0	46.1	39.8	19.8	2	7.0	49.2	42.7	26.0	2	11.0	45.3	37.8	24.7
3	12.0	44.6	35.9	24.5	3	9.9	50.7	44.7	27.2	3	11.3	47.0	40.8	25.0
4	4.5	45.0	38.4	26.2	4	11.2	50.8	43.2	26.0	4	14.8	45.0	39.5	20.0
5					5	12.6	40.9	36.9	43.3	5	16.0	42.7	35.9	18.8
6					6	20.0	43.0	38.6	19.5					
6					6					6				
1	4.6	45.3	39.5	20.7	1	20.3	42.4	35.8	18.4	1	5.1	48.4	42.8	27.2
2	9.3	47.2	39.5	25.2	2	14.9	48.6	43.1	21.9	2	11.3	47.1	39.3	25.0
3	12.2	45.3	38.8	25.3	3	14.7	52.4	47.1	23.2	3	13.3	39.5	31.6	18.9
4					4	12.3	49.6	46.4	27.6	4	14.1	39.1	32.7	19.0
5					5	11.0	53.5	48.3	28.4	5	16.0	38.4	32.7	18.2
6					6	4.7	51.1	44.2	27.4					

44

[illegible]

5

13	1	4.5	50.2	42.3	28.8	No Data	13	1	4.9	48.0	41.6	26.8
	2	9.0	46.8	39.7	25.8	No Data		2	5.0	52.4	47.1	29.2
	3	18.0	39.3	31.2	17.8	No Data		3	11.2	49.8	44.0	26.0
	4					No Data		4	12.0	51.1	46.3	26.7
	5					No Data		5	15.0	53.8	46.0	22.6
	6					No Data		6	17.0	51.8	44.8	23.4
14							14					
	1	4.5	54.9	46.6	27.9			1	5.1	52.8	46.8	28.1
	2	9.0	49.5	40.8	25.5			2	11.2	54.2	47.5	26.7
	3	14.1	38.5	32.5	18.7			3	12.0	52.8	44.2	25.7
	4	18.9	41.8	36.4	19.4			4	15.0	54.0	44.9	22.5
	5	18.0	42.9	34.0	18.4			5	17.0	52.1	47.8	23.5
15							15					
	1	4.5	46.2	42.0	27.0			1	5.1	53.8	47.8	28.8
	2	9.0	47.3	41.8	25.6			2	10.2	50.6	44.0	28.1
	3							3	11.0	53.5	47.0	27.0
	4							4	12.8	49.6	42.1	21.7
	5							5	15.0	53.4	47.8	25.7
16							16					
	1	4.4	44.1	36.9	28.1			1	23.6	47.9		
	2	8.8	47.2	41.3	28.5			2	25.4	41.8		
	3	16.0	44.2	38.1	18.9			3	26.6	42.3		
	4	18.0		32.0	17.8			4	26.2	44.4		
	5							5	26.9	45.6		
	6							6	27.5	44.7		
	No Data							No Data				

# Product Safety Engineering

MAIN.NET PLC, INC

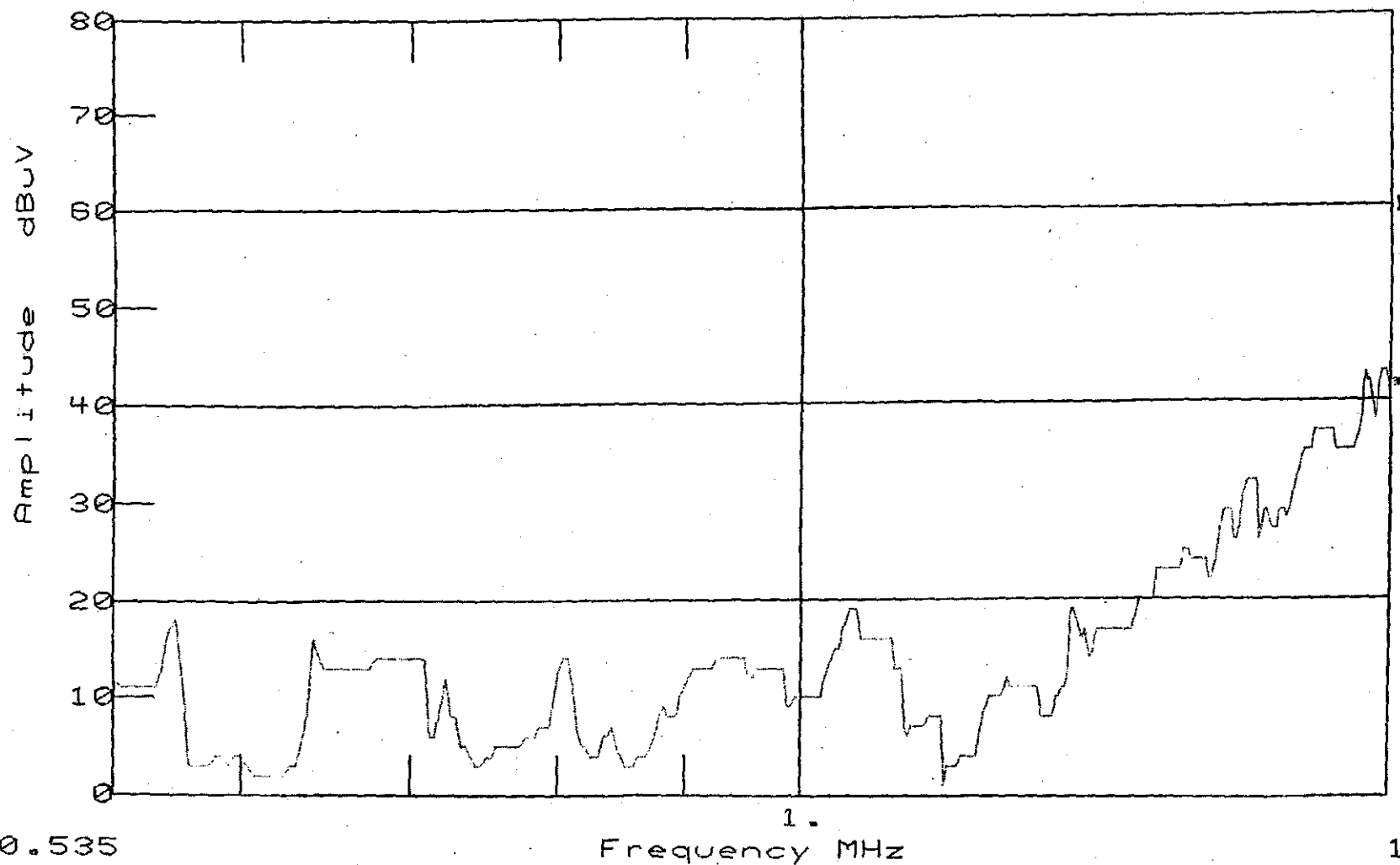
Date : 07/23/03  
Technician : CHIP FOERSTNER  
Test Method : FCC PART 15  
Equipment : NT PLUS 3.0  
Mode of Op. : TX AT POWER LEV#5  
Serial No. : PN PLS10010-000

Time : 13:37:43.51  
Test Equip. : EMC-30  
Test Number : 1  
Sensor Loc. : LINE  
Sensor Pol. :  
Ext. Atten. : 0 dB

EMC-30 SETTINGS  
Detector QuasiPeak  
Bandwidth CISPR  
Dump/Dwell N/A  
RF Atten. 10 dB  
IF Atten. 10 dB

SPECS  
1) Carrier Current FCC  
2)  
3)  
4)

Comment : 120V, 60HZ



ANTENNA  
FILES

OTHER  
FACTORS

E-N

A7

TEST TITLE:MAIN.NET PLC.INC

DATA FILE :332\_L.D30

Amplitude Units : dBuV

Threshold -20 dB

PAGE 1

Freq.(MHz)

0.5350

Freq(MHz)	Amp	CARRIER.S30	
		vs Spec(dB)	
1.6642	41.0	-19.000	*
1.6675	43.0	-17.000	*
1.6709	42.0	-18.000	*
1.6743	42.0	-18.000	*
1.6776	40.0	-20.000	*
1.6877	42.0	-18.000	*
1.6911	43.0	-17.000	*
1.6945	43.0	-17.000	*
1.6979	43.0	-17.000	*
1.7012	42.0	-18.000	*
1.7046	42.0	-18.000	*
1.7050	42.0	-18.000	*

AB

# Product Safety Engineering

MAIN.NET PLC, INC

Date : 07/23/03

Technician : CHIP FOERSTNER

Test Method : FCC PART 15

Equipment : NT PLUS 3.0

Mode of Op. : TX AT POWER LEV#5

Serial No. : PN PLS10010-000

Time : 13:34:53.68

Test Equip. : EMC-30

Test Number : 1

Sensor Loc. : NEUTRAL

Sensor Pol. :

Ext. Atten. : 0 dB

## EMC-30 SETTINGS

Detector QuasiPeak

Bandwidth CISPR

Dump/Dwell IN/A

RF Atten. 10 dB

IF Atten. 10 dB

## SPECS

1) Carrier Current FCC

2)

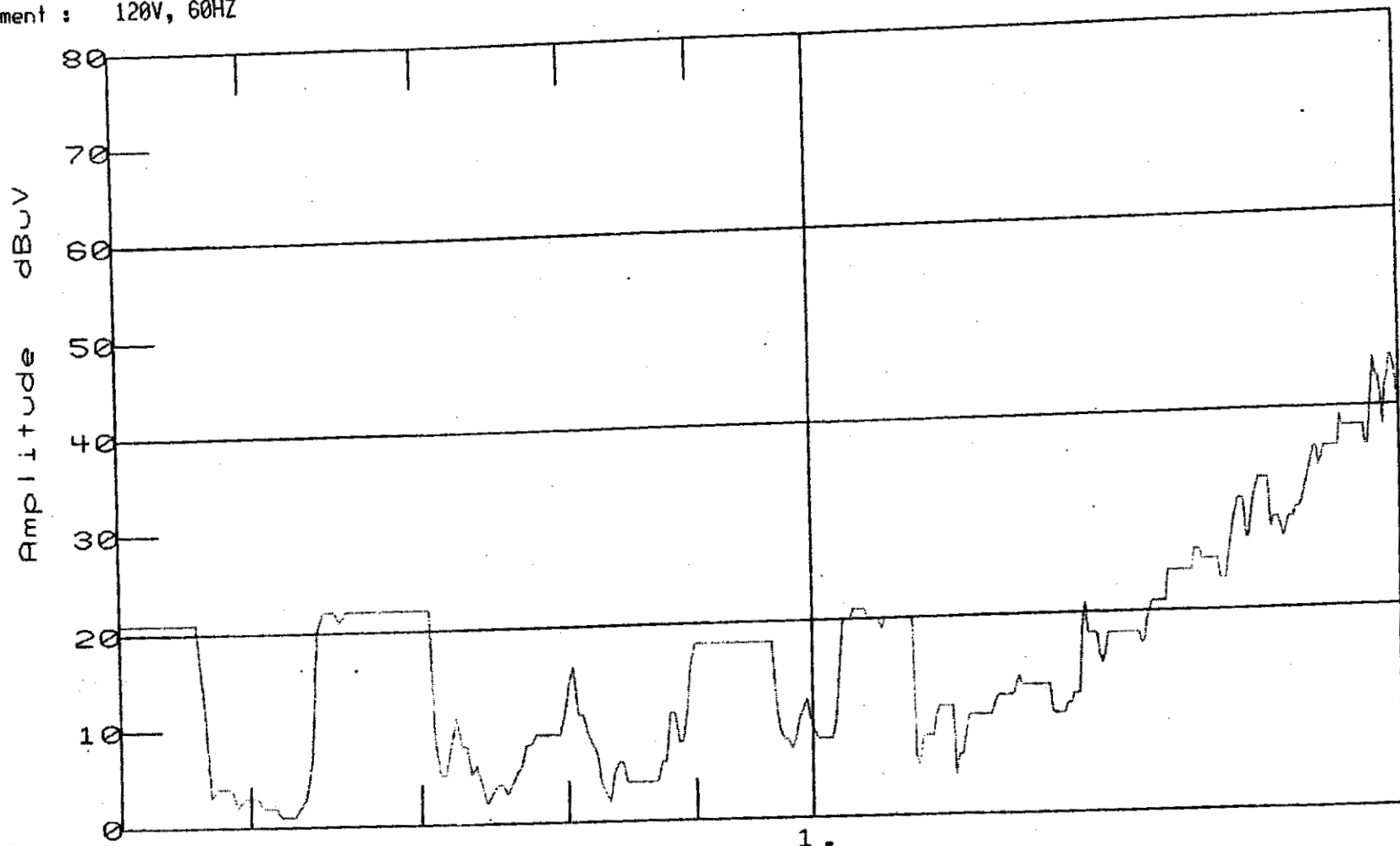
3)

4)

Comment : 120V, 60HZ

ANTENNA  
FILES

OTHER  
FACTORS



1.705

E-11

TEST TITLE:MAIN.NET PLC.INC  
DATA FILE :332\_N.D30  
Amplitude Units : dBuV

Threshold -20 dB

PAGE 1  
Freq.(MHz)  
0.5350

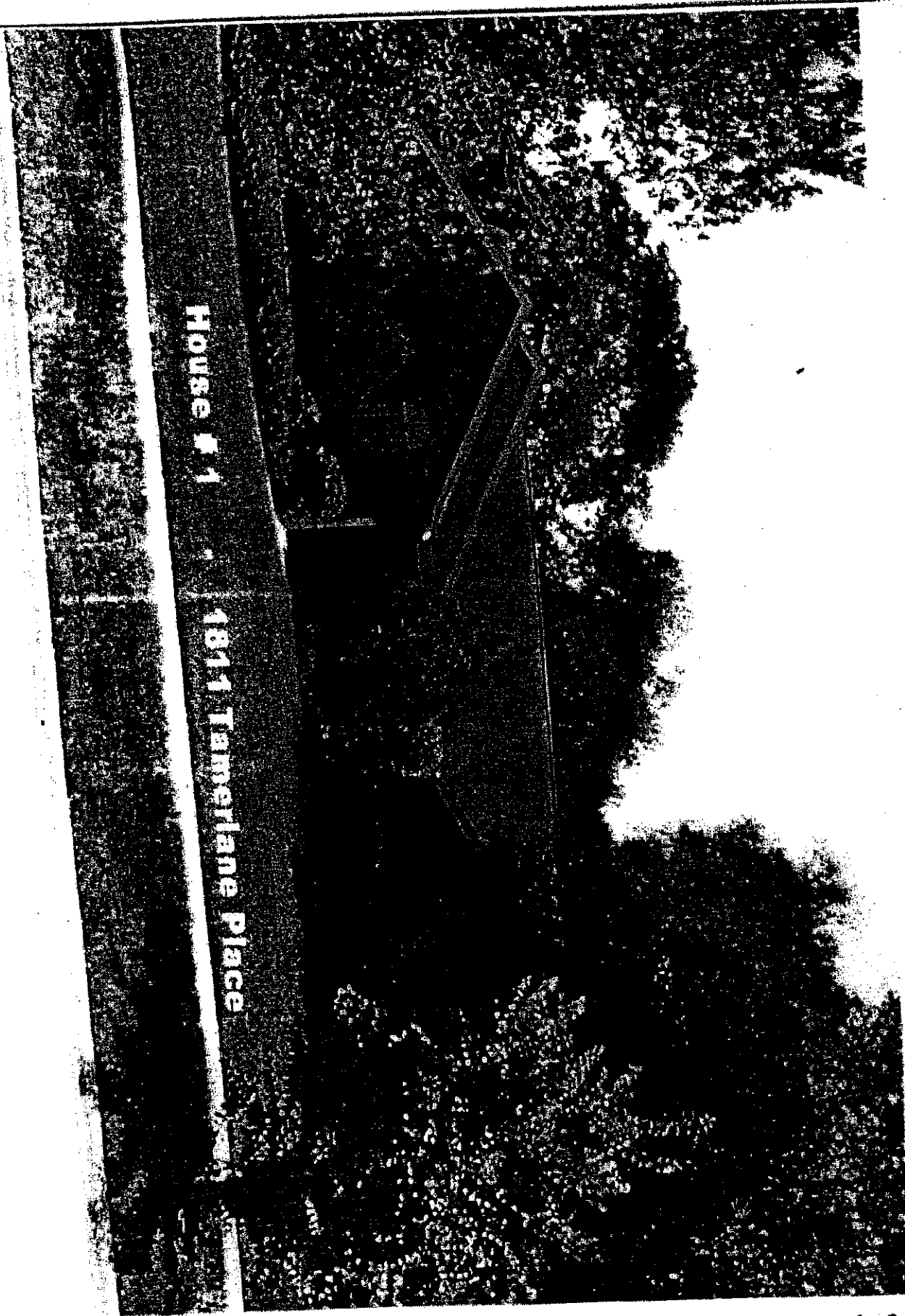
Freq(MHz)	Amp	CARRIER.S30 vs Spec(dB)
1.6642	42.0	-18.000 *
1.6675	45.0	-15.000 *
1.6709	43.0	-17.000 *
1.6743	43.0	-17.000 *
1.6776	41.0	-19.000 *
1.6844	42.0	-18.000 *
1.6877	43.0	-17.000 *
1.6911	45.0	-15.000 *
1.6945	45.0	-15.000 *
1.6979	44.0	-16.000 *
1.7012	42.0	-18.000 *
1.7046	40.0	-20.000 *
1.7050	41.0	-19.000 *

A10



## Home Photos & Layouts

All

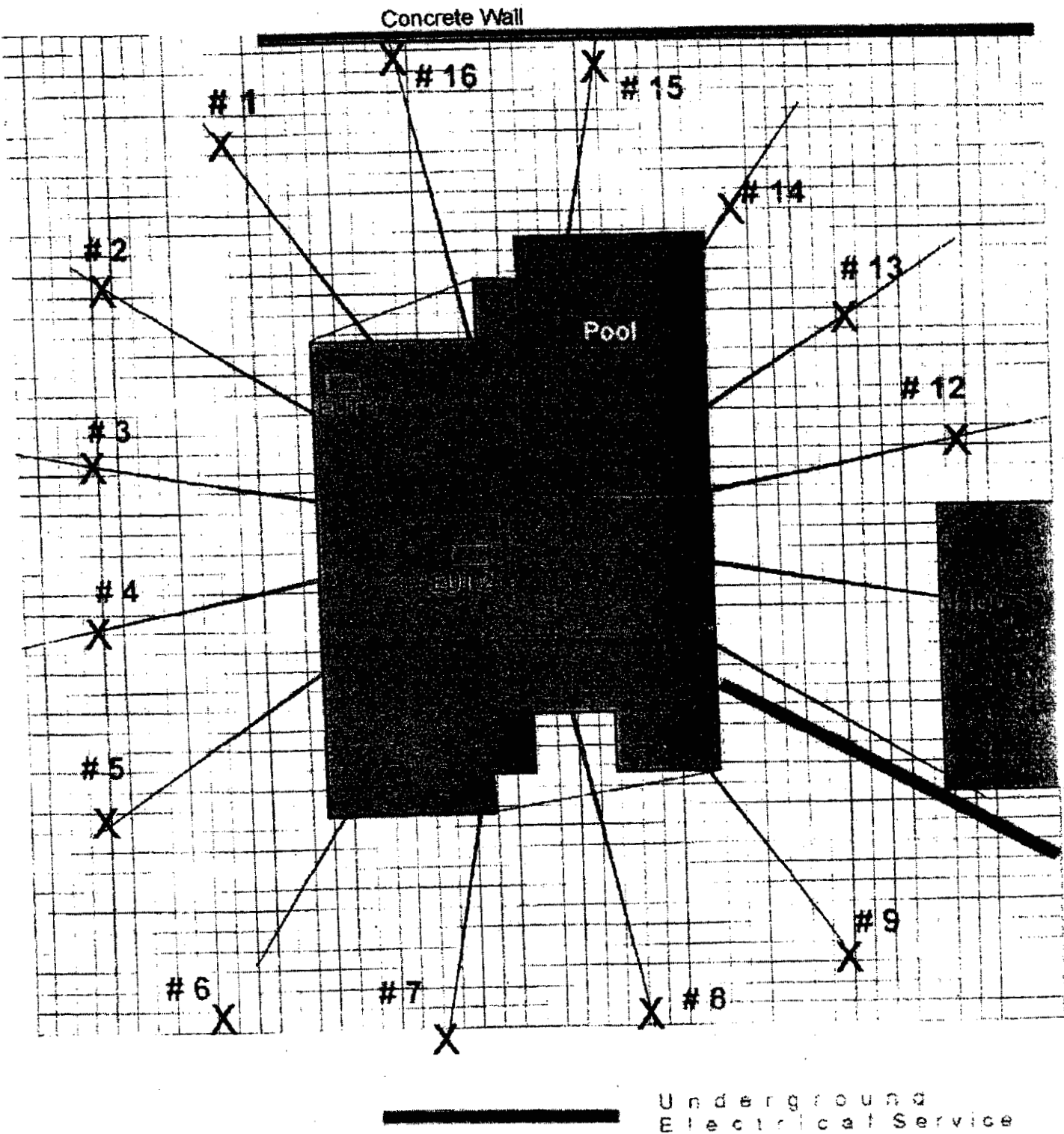


House #1

1811 Tamerlane Place

A12

# House # 1 - 1811 Tamerlane Place

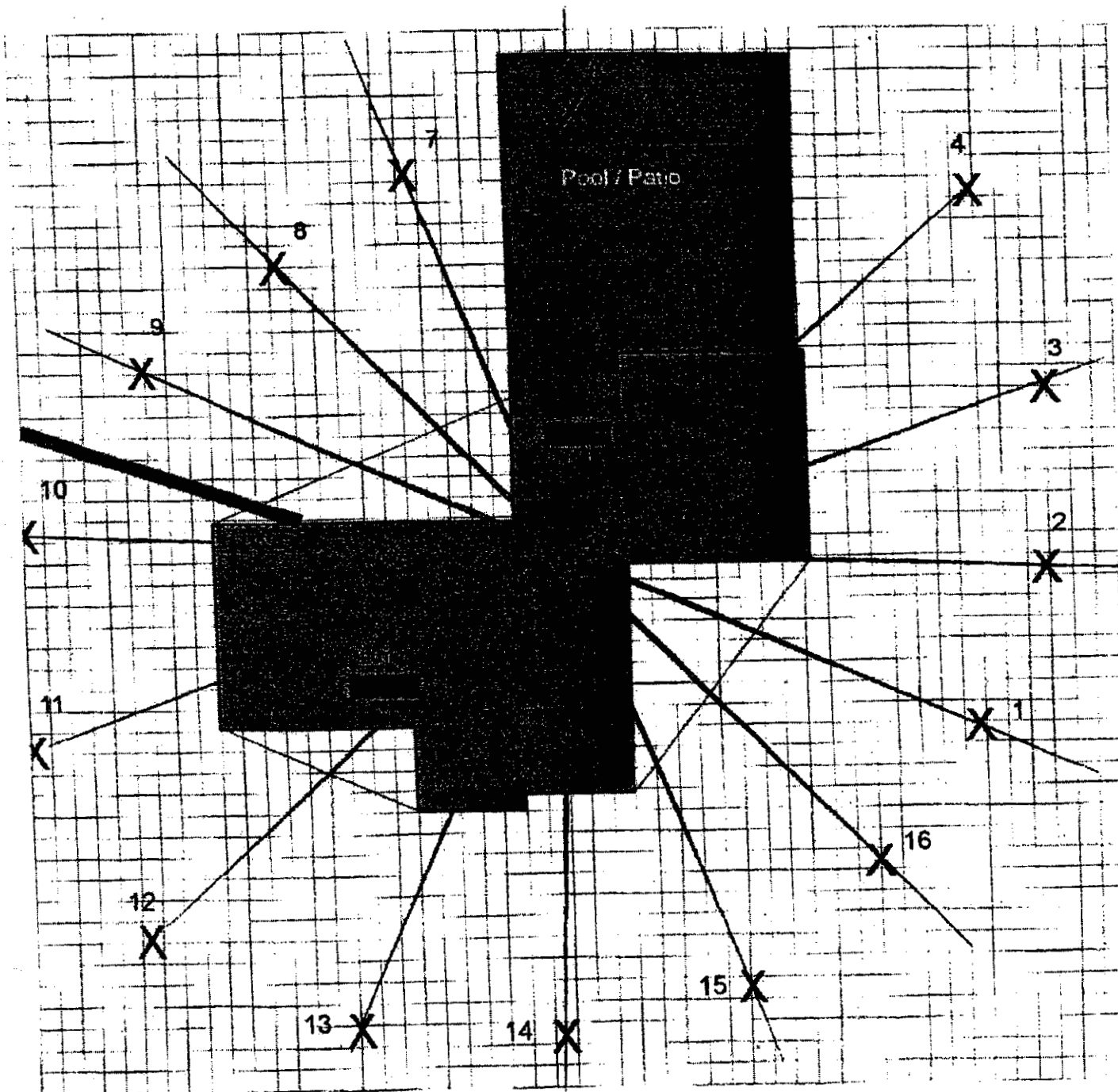



Scale - approx. 3' per square

A13

House # 2 - 33136 Chancey Rd.

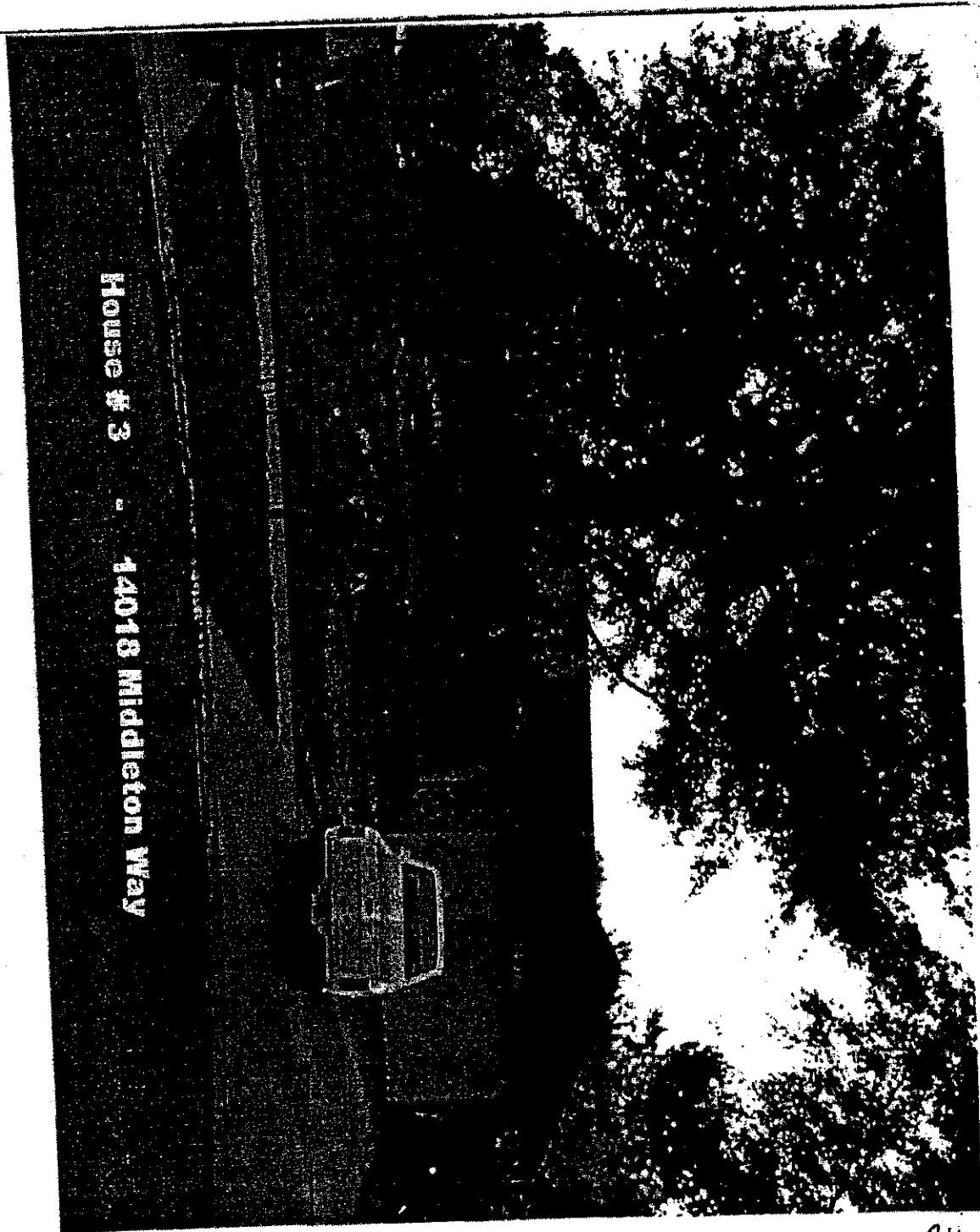
# House # 2 - 33136 Chancey Rd



 Aerial  
Electrical Service

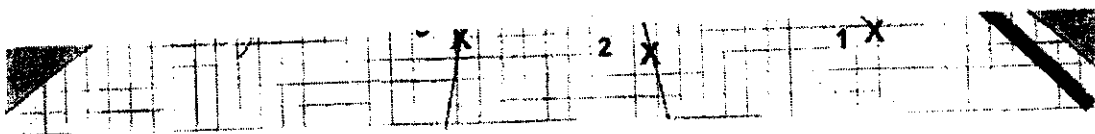
Scale - approx. 3' per square

A15



House # 3 - 14018 Middleton Way

A14

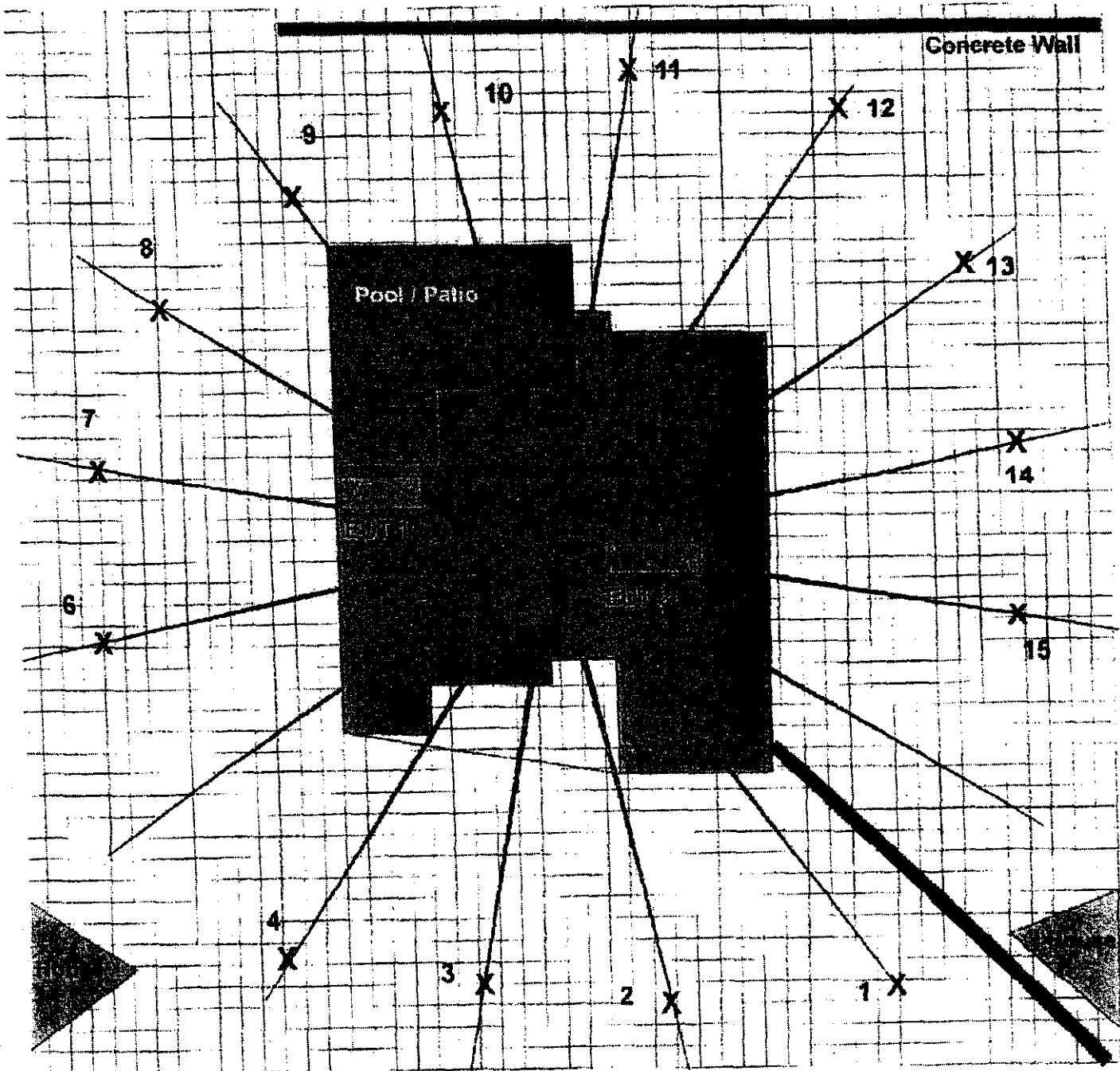


Underground  
Electrical Service

Scale - approx. 3' per square

A19

# House # 3 - 14018 Middleton Way



Scale - approx. 3' per square

Underground  
Electrical Service

# **APPENDIX**

## **B**

### **System Under Test Description**



## SYSTEM COMPONENTS

\*\*\*\*\*

DEVICE TYPE: EUT, Main.Net PLC Inc. Model# NT Plus 3.0

\*\*\*\*\*

DEVICE TYPE: Essenta Laptop Computer

\*\*\*\*\*

DEVICE TYPE: Delta Power supply for Essenta Laptop Computer

\*\*\*\*\*

DEVICE TYPE: E-machines Computer used as Auxillary equipment

\*\*\*\*\*

## **INTERFACE CABLES**

\*\*\*\*\*

DEVICE TYPE: EUT Transmitter

SHIELD: No

LENGTH: 1 Meter Bundled

CONNECTOR TYPE: RJ-45 TO RJ-45

PORT: Ethernet to Laptop

\*\*\*\*\*

DEVICE TYPE: EUT Receiver

SHIELD: No

LENGTH: 1 Meter Bundled

CONNECTOR TYPE: RJ-45 TO RJ-45

PORT: Ethernet to desktop E-Machine computer

\*\*\*\*\*

## AC LINE CORDS

\*\*\*\*\*

DEVICE TYPE: Delta Power Supply

SHIELD: No

LENGTH: 1 METER

CONNECTOR TYPE: IEC TO DEDICATED

\*\*\*\*\*

DEVICE TYPE: EUT

SHIELD: No

LENGTH: 1 METER

CONNECTOR TYPE: 2 CONDUCTOR AC Cord (No Earth)

\*\*\*\*\*

**BOOTH, FRERET, IMLAY & TEPPER, P.C.**

**COPY**

ATTORNEYS AT LAW

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September 8, 2004

Via Courier and Email  
David Solomon@fcc.gov  
Bruce.Franca@fcc.gov

David Solomon, Chief  
Enforcement Bureau  
Federal Communications Commission  
445 Twelfth Street, S.W.  
Washington, D.C. 20554

Bruce Franca, Deputy Chief  
Office of Engineering and Technology  
Federal Communications Commission  
445 Twelfth Street, S.W.  
Washington, D.C. 20554

**RE: Experimental Station WC2XXK (File No. 0093-  
EX-PL-2002; Ameren Energy Communications  
Broadband Over Power Line System at Cape  
Girardeau, Missouri; Request for Immediate Cessation  
of Operation and Revocation of Experimental License**

Gentlemen:

This office represents ARRL, the National Association for Amateur Radio, also known as the American Radio Relay League, Incorporated (ARRL). The purpose of this correspondence and the attached exhibit is to establish that on August 8<sup>th</sup>, 2004, measurements were taken at a BPL trial system located in Cape Girardeau, Missouri, more specifically on Belleridge Pike at its intersection with Melrose Avenue (the Cape Girardeau, Missouri BPL Trial system). The result of tests conducted by Metavox, an independent engineering firm in Dulles, Virginia retained by ARRL, were such that this site has unusually high levels of radiated emissions and is not compliant with FCC part 15 limits. Therefore, the Cape Girardeau, Missouri BPL system is in violation of the specific conditions of the granted experimental license. ARRL therefore requests that

this experimental license be immediately revoked; that the Cape Girardeau BPL system be instructed to shut down immediately; and that it not resume operation unless the facility is shown to be in compliance with Commission rules regarding radiated emissions. As support for these requests, ARRL states as follows:

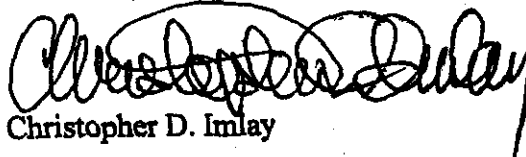
The experimental license, which expired June 1, 2004, is in the name of Ameren Energy Communications and specifies operation between 1.71 and 30 MHz. ARRL has conducted its own independent tests of the Cape Girardeau BPL system using tried and true scientific methods. Attached to this letter as Exhibit A is a report of field strength measurements taken by Metavox President Frank Gentges on August 8, 2004 on Belleridge Pike at its intersection with Melrose Avenue in Cape Girardeau. Mr. Gentges found strong BPL interference at this site, which was impulsive and was distinctive and clearly distinguishable from other users or 60 Hz power line noise. The measurement antenna was placed at a horizontal range of 30 meters horizontal distance from the medium voltage power conductors.

According to the study, the site had unusually high levels of radiated RF and is not compliant with FCC Part 15 limits. The signal structure is consistent with signals observed at other BPL locations. The measured interference levels exceeded the FCC Part 15 limits by as much as 16.6 dB at the FCC specified 30-meter distance. From these measurements taken by Metavox, it is apparent that the radiated emissions from the BPL modems at the test sites are well in excess of what the Commission's regulations permit.

ARRL notes that the standard for exceeding power limits is \$4,000. The terms of the experimental license has been violated in any case, and it must be revoked immediately and the test site shut down. ARRL requests that this test station be shut down immediately and that the appropriate monetary forfeitures be imposed against Ameren Energy Communications.

Kindly address all communications on this subject to the undersigned counsel.

Yours very truly,

  
Christopher D. Imlay

cc: James A. Strenger, Troutman Sanders LLP  
Dan Cole, President, Ameren Energy Communication  
(via U.S. Mail)



45915 Maries Road  
Suite 140  
Dulles, VA 20166-9280  
(703) 444-0511

**Cape Girardeau, MO BPL Trial System Electromagnetic Emission Tests**  
Metavox, Inc.  
August 8, 2004

## **INTRODUCTION**

Metavox, Inc conducted electromagnetic emission testing of the Cape Girardeau, MO BPL trial system. This effort was an independent measurements of the radiated emissions from overhead power line systems distributing Broadband over Power Line (BPL) service to residential subscribers.

BPL systems use digital signal communications of wide bandwidth. The systems are known to occupy spectrum in the frequency region from 1.7 MHz to 30 MHz, with harmonic content into the VHF spectrum. Some of these trial systems operate under Part 5 experimental licenses to conduct testing over a range of 1.7 MHz to 80 MHz.

The purpose of the test conducted here is to measure the field strength of radiated emissions from the BPL system in order to provide a quantitative basis for assessing the potential for interference to licensed radio systems operating in the same frequency range. Most BPL systems seek to operate under limits established by the FCC for Part 15 devices as unlicensed, unintentional emitters. The testing conducted here will assist in efforts to compare the observed BPL emissions to the emission limits established by FCC pertaining to unlicensed devices. Specifically, FCC in Part 15 currently "requires that unlicensed devices operating below 30 MHz comply with a quasi-peak radiated emission limit of 30  $\mu\text{V/m}$  at a distance of 30 meters at all frequencies over the range from 1.705 to 30 MHz." This corresponds to 29.54 dB above one microvolt per meter which is the unit of field strength reported here.

On August 8th, 2004, measurements were taken at a BPL trial system located on Belleridge Pike at its intersection with Melrose Avenue. The results of the Metavox tests are tabulated in Appendix 2: Test Data, a description of the testing and test sites is described in the following sections.

## **APPROACH**

Metavox outfitted a mobile van with calibrated emission-measuring equipment (see Appendix 3: Equipment). The mobility is used in the area of a BPL system to first locate specific positions where the BPL radiated emission is clearly detectable. A picture at the Cape Girardeau test site is shown in Figure 1. Figure 2 shows the electronics bench in the van interior with (from left to right on the bottom row of equipment) an HP 141T/8553L/8552A spectrum analyzer, a Tektronix 485 oscilloscope, and the Rohde & Schwarz ESH 2 test receiver. Above them is a Boonton 92A-S2 RF millivoltmeter and a Teac RD-111T PCM instrumentation recorder.

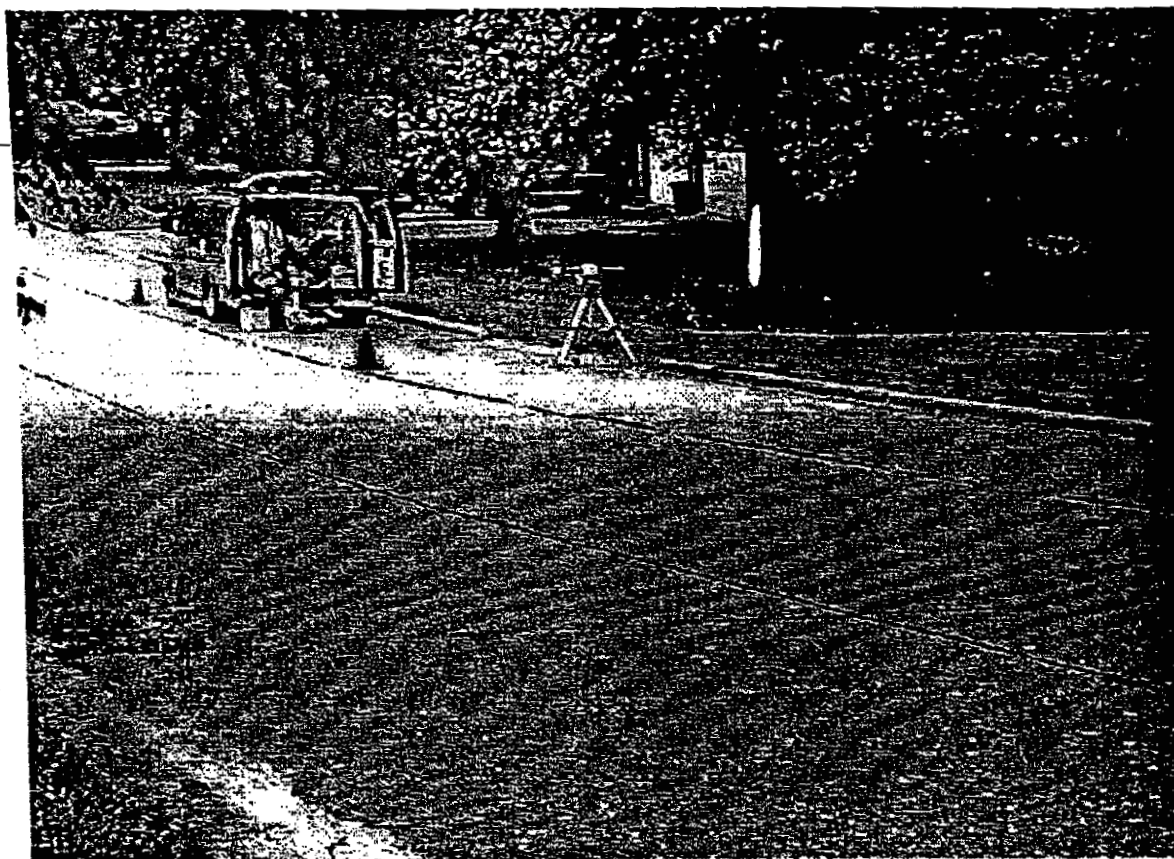
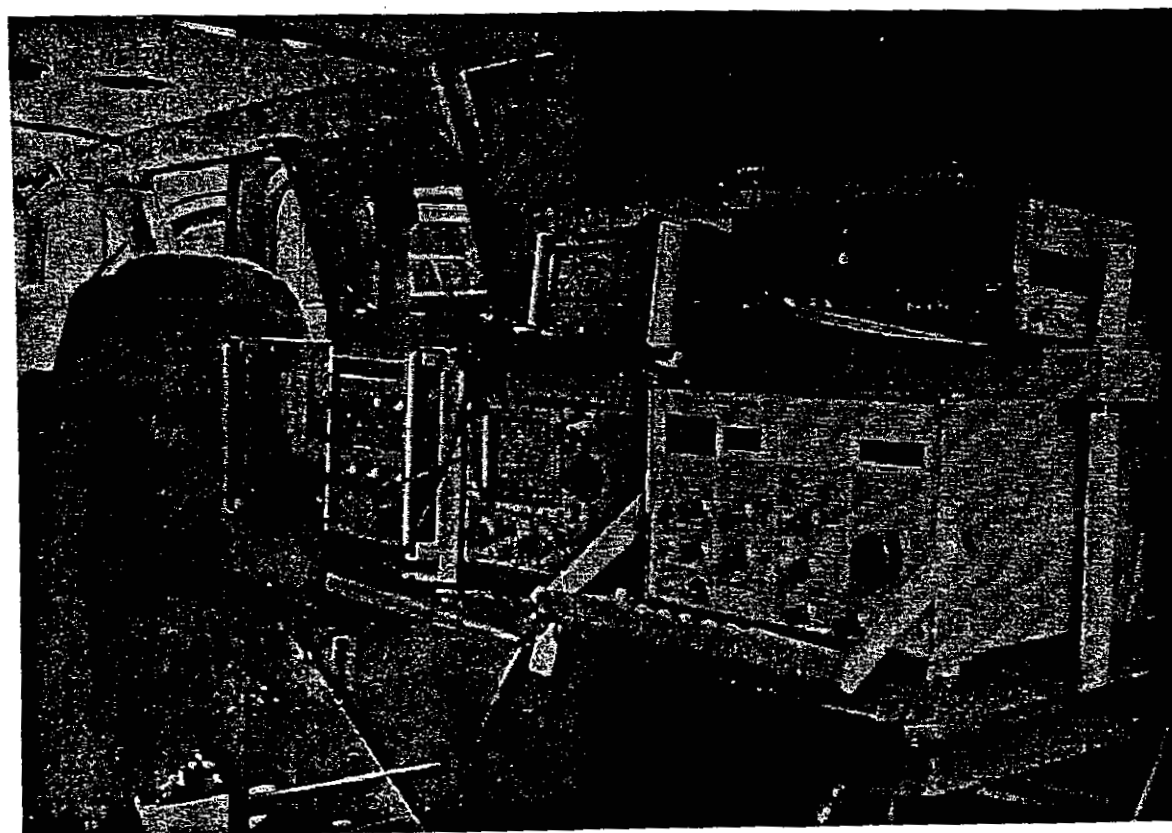


Figure 1 Test Van Set Up at Cape Girardeau Test Site



For signal level measurements, the ARA BBH-500/B active loop antenna is set out at about 5 to 10 meters from the vehicle as shown in Figure 1. The tripod positions the center of the loop at 1 meter above the ground. The full array of equipment is used in site selection to determine that the BPL signal is distinguishable and that the signal strength is adequately handled within the dynamic range of the instruments. However, in the test measurement process, only the active loop antenna, ARA model Model BBH-500/B and ESH 2 receiver are used for taking data. These instruments are calibrated to standards traceable to National Institute for Standards and Technology (NIST). Each field strength measurement is accurate within  $\pm 1.5$  dB since measurement accuracy is the combination of (uncorrelated) factors for the antenna (ARA model Model BBH-500/B) and the test receiver (Rohde & Schwarz ESH2) as given in the Appendix 2: Equipment.

Antenna placement and orientation was made considering all of the conductors of the surrounding power distribution system including the medium voltage power conductors, the secondary cable between transformers and the secondary cables to houses. A measurement of the output of the active loop is first made using a 300 MHz bandwidth Tektronix 485 oscilloscope to insure the active circuits are not overloaded by a strong signal. Measurements were then taken at three orthogonal orientations of the antenna for each frequency. Measurements were made using the receiver's CISPR mode. The CISPR measurement mode provides an objective measure of the effect of an interference on the reception of radio telephony.

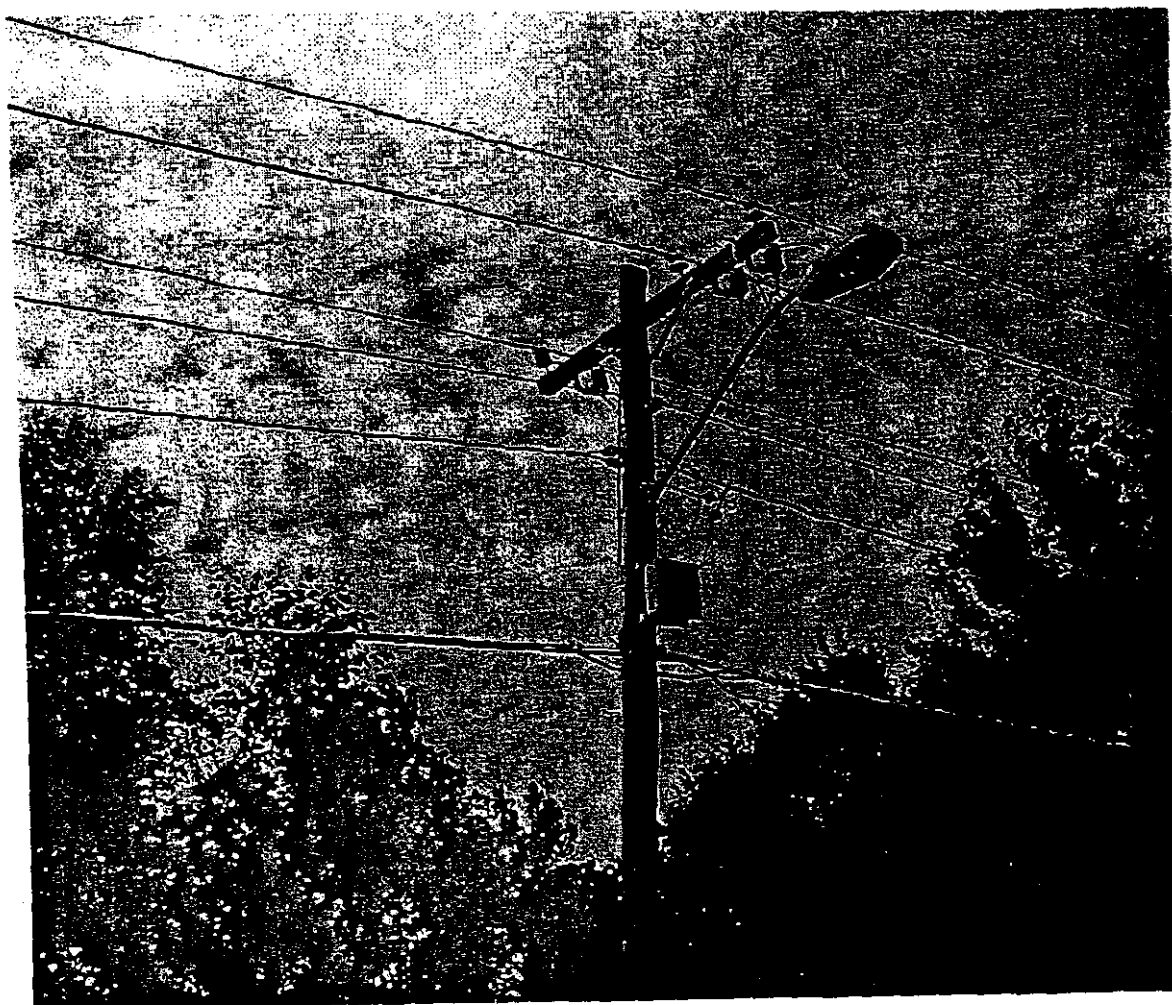


Figure 3 Cape Girardeau Test Site Power Pole and Lines Including BPL Installation



## TEST DESCRIPTION

### Cape Girardeau-1

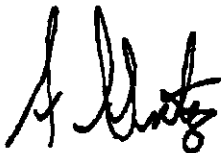
Testing was performed on a trial BPL system operating at Cape Girardeau, MO.. (see Appendix 1: Sites, Cape Girardeau-1) on August 8th, 2004. The detailed results are presented in Appendix 2: Test Data, Cape Girardeau-1 for a 30 meter horizontal distance from the power line.. The far right hand column is the RMS of the 3 field strength. This value bounds the worst possible level of interference by orientations. It may not determine non-compliance with FCC Part 15. The single axis measurements shown in bold type indicate non-compliance.

Figure 3 shows the overhead line on a pole along Melrose Avenue at the intersection with Belleridge Pike. This figure shows three-phase medium voltage lines running along Melrose Avenue. Telephone and fiber optic cables are below the medium voltage lines. The BPL interference at this site was impulsive and was distinctive and clearly distinguishable from other users or 60 Hz power line noise. The measurement antenna was placed at a horizontal range of 30 meters horizontal distance from the medium voltage power conductors.


## CONCLUSIONS

This site had unusually high levels of interference and is not compliant with FCC Part 15 limits. The signal structure radiated is consistent with signals observed at other Main.Net sites.

The measured interference levels exceeded the FCC Part 15 limits by as much as 16.6 dB at the FCC specified 30 meter distance. It is possible that these levels could be reduced with system level adjustments and other system grooming to bring the system into conformance with the FCC limits.



Frank H. Gentges  
President Metavox Inc.

  
R. A. Geesey, PhD  
Technical Consultant  
André V. Kesteloot  
Life Senior Member, IEEE  
Technical Consultant  
B. E. Keiser, DScEE, PE  
Project Consultant